

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Expanding Fixing Plugs for Walls and other Purposes

I, ERNST JORDAN, a German Citizen, of Leinpfad 17, Hamburg 39, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to fixing plugs for walls and other purposes. Longitudinally corrugated expanding wall fixing plugs are already known. They have not been successful because they produce insufficient grip between the screw and the plug. To improve grip it has been proposed to make the plug of soft material such as zinc or lead. However these plugs have also proved unsatisfactory because the tensile strength of the soft material is too low.

The invention provides a durable connection between the fixed member and the plug of a kind that can be readily undone at any time, by making use of a plug consisting of hard ribbon or strip material—preferably iron or steel strip—with longitudinal corrugations, into which the fixed screw impresses a female thread as it is driven into position, thereby creating a threaded connection in the manner of a bolt and nut between the screw and the plug. Despite the thin section of the ribbon material from which the plugs may be mass-produced the longitudinal corrugations impart a high degree of rigidity and considerable strength to the plug, enabling the plug to withstand the shock of being knocked into the wall. The threaded connection between plug and screw offers considerable resistance to extraction of the screw and the process of driving the screw into the plug expands the plug and causes it to grip the hole in the wall very tightly.

Wood or metal screws with a cylindrical or tapering shaft are suitable. Wood screws are to be preferred because they have specially sharp edged threads which more readily bite into the longitudinal corrugations of the plug.

Since in such screws the depth of the thread is first low and gradually increases up the screw shank, the female threads impressed in the plug corrugations will at first be somewhat shallow but will gradually deepen as the screw is driven further into the plug. The greater pitch (axial distance between consecutive convolutions) of the threads in wood screws also facilitates the formation of the female thread in the plug.

It is desirable that radial pressure of the plug in the wall should be greater inside the wall than near its surface. This can be achieved if the angle of taper of the corrugated plug is wider than that of the shank of the screw. The greater the difference in relative taper the tighter will the plug be fixed in the hole.

Driving the plug into the wall may be facilitated if the end of the plug has a conical and preferably uncorrugated extension. The extension may be replaced by a necked extension which affords the advantage of flattening and spreading radially when forced into contact with the inner end of the hole and of thereby providing a further safeguard against loosening of the plug.

A known arrangement in plugs is for their longitudinal edges to overlap slidably. In longitudinally corrugated plugs the existence of such sliding lapped edges adversely affects the distribution of the load. To ensure that in plugs with abutting and overlapping edges rigidity and load distribution will not be impaired but rather improved it is proposed by the invention to corrugate only one of the overlapping parts of the plug, the other overlapping part being corrugated up to its adjacent edge. This form of construction improves the slidability of the overlap and at the same time appreciably increases the strength of the plug at this weakest point. Moreover in such a form of construction the total load will be more evenly distributed axially and peripherally over the entire surface of the plug.

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The plug can also be used if the hole in the wall happens to be excessively large or somewhat too small. If the hole is too small one edge will slide over the other to an appreciable extent, whereas in a hole that is rather too large this will not be the case and the plug may even open up slightly without thereby reducing its strength which will be maintained by the marginal corrugation of the underlapped edge.

It need not be specially mentioned that an even distribution of the total load between all the turns of the thread is secured in that the full flank of each turn of the thread of the screw will bear against the corresponding flank of the thread impressed by the screw into the plug. Since the greater depth of the thread of the screw and of that in the plug improves the threaded connection a wood screw with threads of considerable depth is preferred. Uniformity of load distribution in the threads of screw and plug will at the same time have the effect of strengthening and more evenly distributing the pressure of the plug against the sides of the hole in the wall.

Recently sheet metal screws and screw nails have found increasing favour as fixing means. Although such types of substitute screws are not quite as efficient as conventional screws they can nevertheless be employed in conjunction with plugs according to the invention. When these are knocked into the plug the pronounced resilience of the corrugations first permits the screw nail or sheet metal screw to slide into the plug and to create considerable pressure of the plug against the sides of the hole. However, the screw nail or sheet metal screw will eventually bite into the corrugations of the plug. In order to promote a satisfactory connection between plug and a screw nail or sheet metal screw, the strip material employed should be resilient and springy.

A special advantage of the proposed plug assembly is that it can be used again if it should be undone, that the parts are exchangeable, and that the fixing can be re-tightened. With reference to repeated use special comment is not required as the simplicity of the shape of the plug makes it obvious that such a plug can be used again. Since the screw presses female threads into the plug so that the connection is tantamount to a screwed joint, it will be clear that the screw can be undone when required. If the wall should consist of a soft and yielding material or if the wall should be subject to vibration, it is impossible to avoid that the connection between the screw and the plug will work loose in course of time. In such a case the plug can still be used. If it is impossible to tighten the existing screw a slightly larger screw may be inserted. The old plug will then retighten as well or even better than before.

The proposed fixing means also provide

the following additional advantages: low weight, small size, low cost, and shock absorbing capacity.

By way of example, various embodiments of the invention will now be described, with reference to the accompanying drawings, in which:—

Figure 1 shows a plug with a slight internal taper, and externally either tapered or cylindrical, 1a shows the screw inserted and 1b driven home;

Figure 2 is a plug with a considerable internal taper, and externally either tapered or cylindrical. This plug will be forced more tightly against the walls of the hole in the wall; 2a shows the screw inserted and 2b driven home, considerably expanding the plug;

Figure 3 is a cross section of a plug in accordance with the invention. The lapped edge permits the plug to adapt itself to a larger or smaller hole; 3a cross section without the screw, 3b cross section with the screw just inserted, 3c cross section with the screw screwed well home;

Figure 4 shows a plug with an uncorrugated necked extension which flattens against the end of the hole; and thus assists in resisting extraction; 4a shows the plug before being knocked into the hole, 4b after having been knocked into the hole; and

Figure 5 is a plug with a tapered end; which facilitates the introduction of cylindrical plugs into holes.

The invention is not confined to the production of a safe connection between a fixing means and a plug. It may also be applied to the purpose of joining or securing several objects together, such as for instance two or three wall panels or fibre sheets. In the building trade it has been the practice to provide fibre or hard wood panels for lining brick walls, which are expensive to erect, for the purpose of producing a heat insulation or protecting them from penetration by moisture. It is not easy to secure such panels to walls. The invention permits the development of a new building technique based on the use of light standardised structural units which can be easily transported, assembled, and secured, which greatly reduce the weight of the building and substantially lower building costs. Instead of heavy and bulky walls which serve at the same time as "supporting" and "insulating" means and which, owing to the small size of the bricks, consume time and money to build, it is now possible to use readily attachable panels, such as fibre panels, hard wood panels, retaining panels, sound-proofing panels, insulating panels, bitumen panels, and the like, which owing to their low weight permit structural weight and cost to be lowered. Hitherto the erection of such panels was a tedious process. As many as

six separate operations where sometimes required:—

1. The erection of battens for securing the panel;
2. the insertion of insulation in the form of bitumen strips between brickwork and battens;
3. pinning or cementing the battens to the brickwork;
4. painting the battens;
5. fixing the panels to the battens.

The invention permits the panels to be directly secured to the brickwork in one operation. The heavy brickwork may be replaced by a framework wall consisting of concrete, steel, or timber, and lined on one side or both sides with panels in the manner that will be described. The advantage of the proposed method is not only the saving in cost due to the elimination of several operations but also the saving in space and the increase in useful area achieved by the elimination of battens or even of a brick wall.

Figure 6a is a plug similar in shape to that shown in Figure 1b. The length of the plug is approximately equal to the total thickness of two panels or of one panel and a brickwork wall. When the screw is screwed into the plug it impresses its thread into the corrugations of the plug and tightens the plug in the panel as well as in the brickwork or framework wall. To impart a better grip to the plug at the point of entry of the screw it is here provided with a flared end.

Figure 6b is a plug with flanged ends for engagement with the outer surfaces of the parts to be secured by the plug whereby the connection between the secured parts, may be improved;

Figure 6c is a plug without a flanged end.

Figure 6d is a laterally divided plug consisting of two portions which may be of similar or dissimilar length. Contact pressure is thereby increased as the screw is driven into the two parts to be united.

Figure 6e is a plug which is used with a short flanged sleeve having a clearance hole for the screw. When the screw is driven in it will bite into the corrugated plug and will clamp the two panels tightly together, the clamping action being assisted by the flanges on the sleeve and plug.

For the purpose of connecting three panels or more, or when dealing with panels, battening, and brickwork of considerable thickness it is advisable to interconnect two plugs by means of a tube or split sleeve.

Figure 7a is an embodiment in which two panels are secured to a brick wall or a batten frame by connecting the two plugs together with a split sleeve. As shown, the split sleeve is somewhat longer than the thickness of the brickwork or batten frame.

Figure 7b shows a similar form of construction. In this instance the tube or split sleeve is approximately as long as the com-

bined thickness of the three members that are connected together. The tubes or split sleeves may have longitudinal corrugations.

Figure 7c is an embodiment in which thinner panels are secured to the brickwork or framing. By tightening the two screws the panels are pulled securely against the brickwork.

The invention is not restricted to the fixation of panels or the like to brickwork and may with equal advantage be used in the construction of vehicle bodies for fixing lining panels to the wooden or metal structure of the body.

In the following further embodiments of the invention a sleeve-like plug is provided with locking fingers which prevent the plug and the objects connected thereby from being loosened. Sleeve-like plugs of this kind are especially useful if they are required to be passed through a panel or plate to which other objects are to be secured, and held in position by means on the plug at the back of the panel for preventing the plug from being extracted or, alternatively, if the objects that are to be thus secured are themselves to be secured to the plug, for preventing them from being accidentally detached.

It is irrelevant to the invention whether such spring locking fingers are attached to the sleeve-like plug or whether they are formed on the plug by stamping or whether they are formed on the end of the plug by incisions and the subsequent creation of a pleated edge. The locking fingers need merely have a shape which, on the one hand, will permit the plug to be slidably inserted through the hole provided for the reception thereof, or the objects that are to be secured to be slidably pushed on to the plugs, and which on the other hand will then effectively provide locking means by springing up and preventing reextraction when the fitting has been completed. Such spring locking fingers may be provided on one or on both ends of the plug. Moreover, they may be formed near one end or in the centre of the plug.

Figure 8a is a sleeve-like plug with a flange at one end and spring locking fingers at the other end which spring open when the plug has been pushed through the wall or panel and retain the plug in position;

Figure 8b is a similar plug in which the spring locking fingers are formed by reflexing the edge of the plug;

Figure 8c shows a plug with the spring locking fingers arranged in the centre part of the plug;

Figure 8d is a plug for securing an object to one face of a wall or panel in cases where the object is already present before the plug is pushed through the wall or the panel, or the object is required to be subsequently pushed over the locking fingers;

The plugs shown in Figures 8a, 8b 8c and

8d are used with screws in a similar manner to that shown in the previous arrangements.

Figure 8e shows an object which has been pushed over the reflexed fingers of a plug and which is retained in place by the opening out of the fingers, the whole being secured by the insertion of a screw in the plug.

Figure 8f shows a plug which has reflexed spring fingers at both ends which open out to secure a panel to a wall, for instance, the plug being tightened in the wall by the insertion of a screw in the plug.

Figure 9a illustrates a connection between several objects by a plug having spacing fingers, the plug being tightened in the central object by the insertion of a screw in the plug; and

Figure 9b shows four objects secured together by a plug having spring fingers at both ends, the plug being tightened in the objects by a screw (not shown) which may be driven in from either end of the plug.

WHAT I CLAIM IS:—

1. An expandable fixing plug comprising a longitudinally split sieve formed from hard metal sheet or strip and having overlapping marginal portions adjacent the split, and longitudinal corrugations on the sleeve, the exterior overlapping portion being uncorrugated, the arrangement being such that when a screw is driven into the sleeve this expands as the screw bites into the corrugations to form a screw thread so that the sleeve serves as a nut to establish a threaded connection.

2. A plug according to Claim 1, which is internally and externally tapered.

3. A plug according to Claim 1 having an uncorrugated neck portion at one end which is adapted to be flattened and extended laterally when the plug is driven into a hole

thereby locking the plug in the hole.

4. A plug according to Claim 1, having a tapered end whereby the entry of the plug in a hole is facilitated.

5. A plug according to Claim 1, wherein the sleeve is formed with a flange or reflexed edge at one or both ends.

6. A plug according to Claim 5 wherein the plug is divided laterally to form two portions.

7. A pair of plugs each according to Claim 1, 2, or 4, connected together by an axially aligned tube, each plug of the pair being adapted to receive a screw whereby it may be expanded to fit tightly in the tube.

8. A pair of plugs each according to Claim 1 and each having a flange or reflexed edge at one end in combination with a tube or split sleeve into which the plugs are expanded when a screw is driven into each plug.

9. A pair of plugs according to Claim 8, wherein the tube or split sleeve has longitudinal corrugations.

10. A plug according to Claim 1, having a plurality of spring fingers at one or both ends which are adapted to open out to engage the exterior surfaces of the parts to be secured by the plug.

11. A plug according to Claim 1, having a plurality of spring fingers positioned intermediate the length of the plug, which fingers are adapted to open out when the plug is driven into a hole thereby securing the plug in the hole.

11. Expandable fixing plugs substantially as herein described with reference to the accompanying drawings.

WITHERS & SPOONER,

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Agents for the Applicant.

a

FIG.1

b

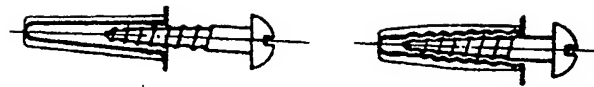


FIG.2

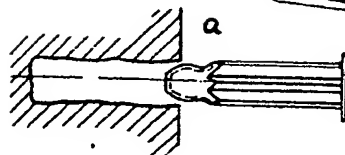
a

b



FIG.4

a



b

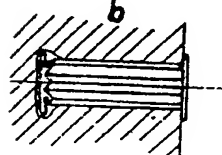


FIG.3

a

b

c

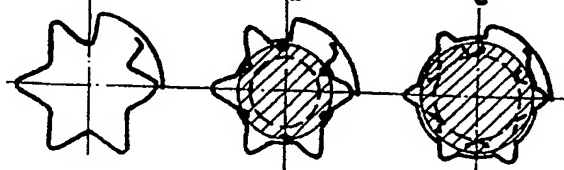
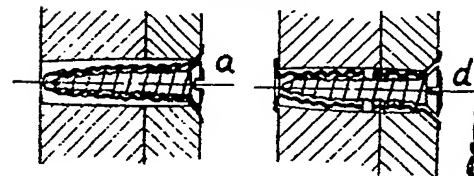


FIG.6

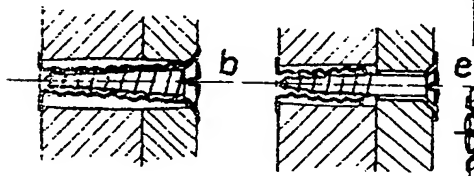
a

d



b

e



c

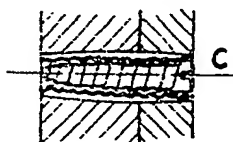


FIG.5

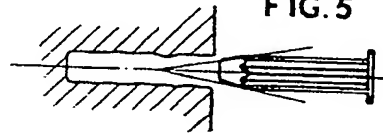
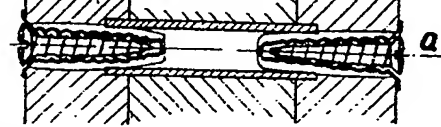
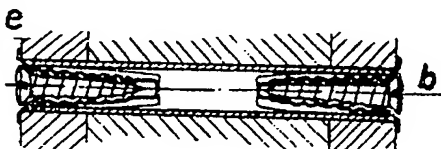


FIG.7

a



b



c

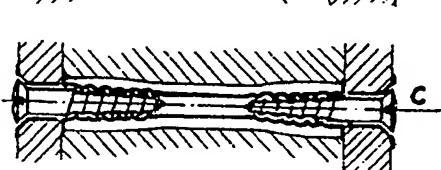


FIG. 8

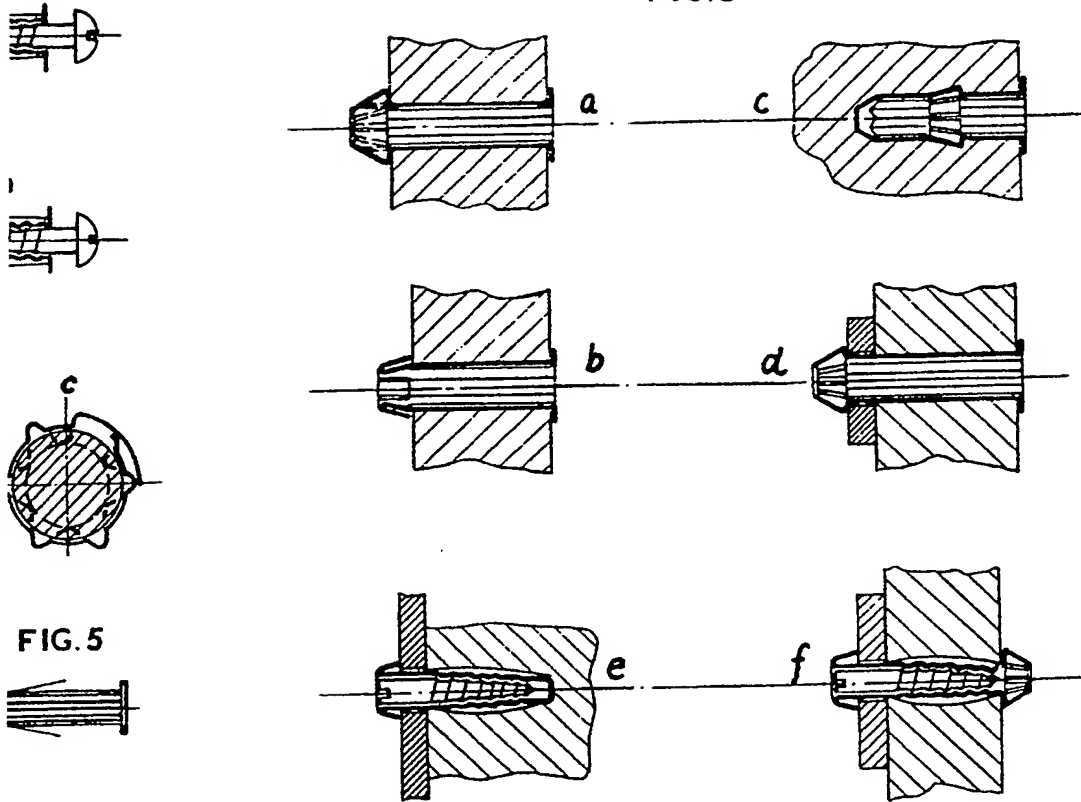


FIG. 5

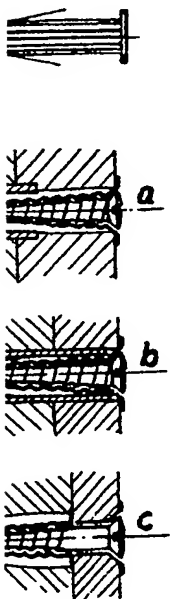


FIG. 9

